

Shelby Co. ATC Industrial Maintenance Students Become Experts at Building Medieval Trebuchet

Arbalest, arbalist, ballista, bricole, mangonel, onager, and trebucket are all synonymous for trebuchet; however the most common name is catapult – and Jim Cash's industrial maintenance students have designed and built an excellent working model – a 400-pound-counterweight catapult made of steel and wood.

View of the small catapult in the foreground and larger version in the background. Front row from left to right around the catapult is Brandon Howard, Instructor Jim Cash, Kyle Bentley (kneeling and loading a softball), Chris Miller and Zach Allgier. They are getting ready to launch a softball.

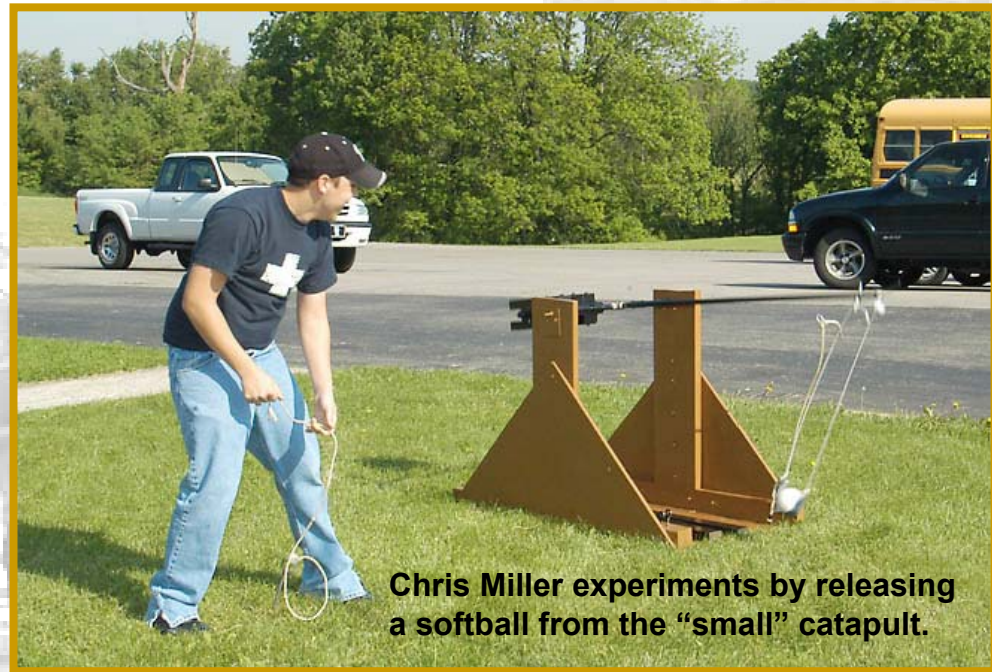
Other students in the background include Gerardo Villa (top left), Chris Jackson (holding a paper catapult made by the physics class) and Andrew Goodlet (far right).



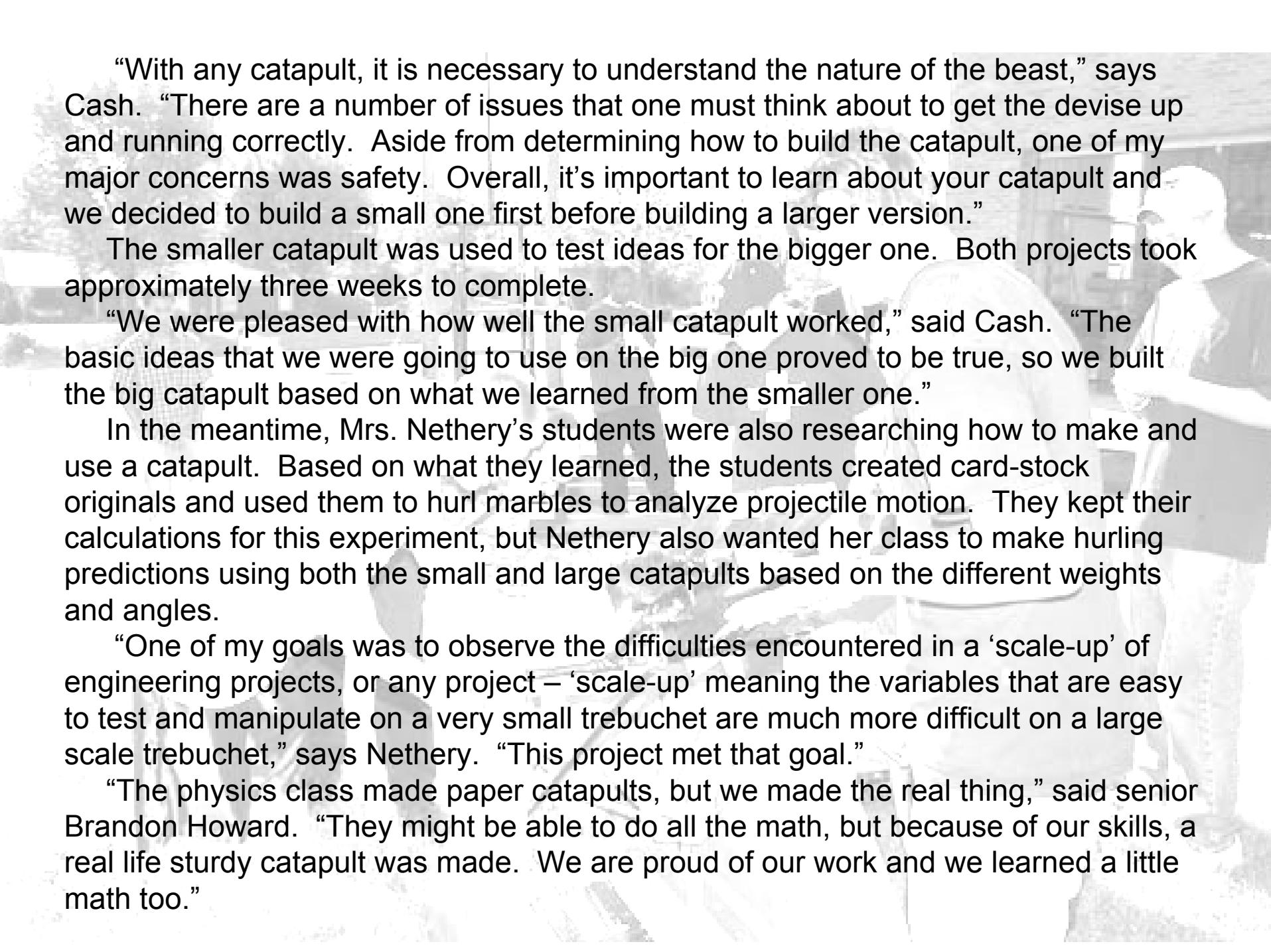
Last year Jim and his wife Lorie met Joyce Nethery, the Shelby Co. high school physics teacher, while attending a school picnic for all the staff. Through the course of conversation, discussion was initiated about doing a collaborative project and the idea of building a catapult was launched. This cooperative effort between both teachers turned into a well-designed academic and technical education project for their students – one the kids have thoroughly enjoyed learning about, working on and participating in.

“When Mrs. Nethery called me this past February to confirm the project and discuss goals, I knew this would be a worthwhile endeavor,” said Cash. “She was interested in doing a physics unit to teach kids about arcs and angles, weights and counter-weights and force and distance. One of her goals was to perform real-life analysis of projectile motion including velocity, range and identifying variables. So, for me and my students to be ready for our part of the unit, it was imperative for us to get to work by doing some research of our own.”

What exactly is a catapult? Through Internet research from England and Scotland, Cash and his students found that a catapult was a piece of medieval artillery used for hurling large stones or other projectiles during sieges. The trebuchet was the most advanced of all the catapults used in Europe from 850 AD to 1350 AD and lasted approximately 100 years after the introduction of gunpowder.



Chris Miller experiments by releasing a softball from the “small” catapult.



“With any catapult, it is necessary to understand the nature of the beast,” says Cash. “There are a number of issues that one must think about to get the device up and running correctly. Aside from determining how to build the catapult, one of my major concerns was safety. Overall, it’s important to learn about your catapult and we decided to build a small one first before building a larger version.”

The smaller catapult was used to test ideas for the bigger one. Both projects took approximately three weeks to complete.

“We were pleased with how well the small catapult worked,” said Cash. “The basic ideas that we were going to use on the big one proved to be true, so we built the big catapult based on what we learned from the smaller one.”

In the meantime, Mrs. Nethery’s students were also researching how to make and use a catapult. Based on what they learned, the students created card-stock originals and used them to hurl marbles to analyze projectile motion. They kept their calculations for this experiment, but Nethery also wanted her class to make hurling predictions using both the small and large catapults based on the different weights and angles.

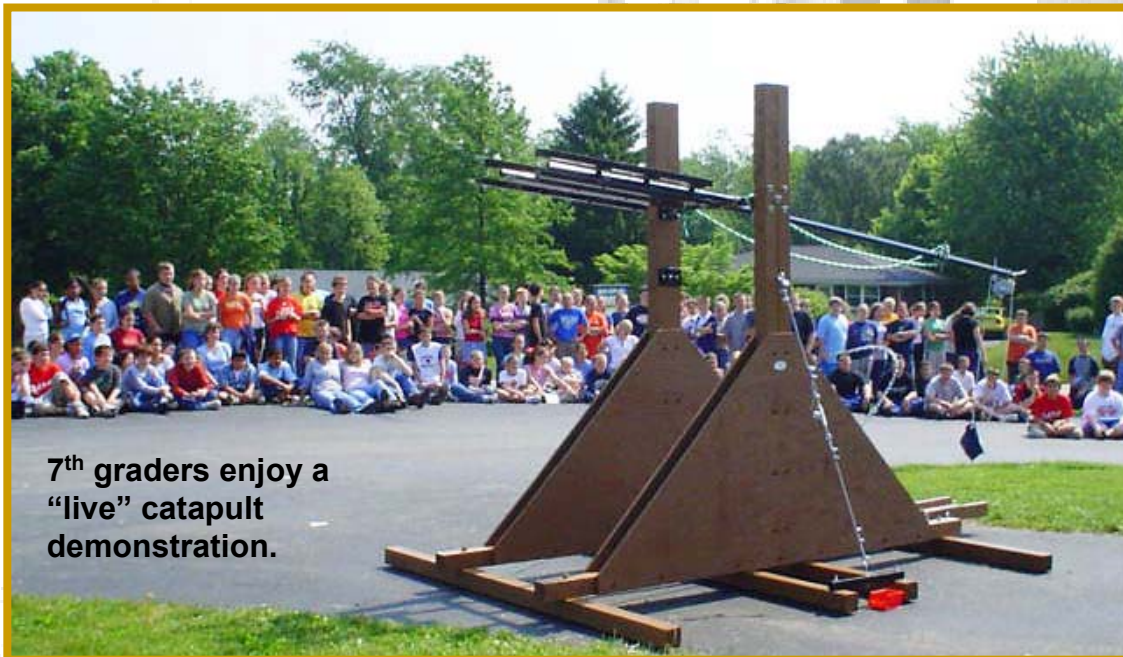
“One of my goals was to observe the difficulties encountered in a ‘scale-up’ of engineering projects, or any project – ‘scale-up’ meaning the variables that are easy to test and manipulate on a very small trebuchet are much more difficult on a large scale trebuchet,” says Nethery. “This project met that goal.”

“The physics class made paper catapults, but we made the real thing,” said senior Brandon Howard. “They might be able to do all the math, but because of our skills, a real life sturdy catapult was made. We are proud of our work and we learned a little math too.”

The culminating event for this entire project was when the physics and industrial maintenance classes gathered for hurling experiments. After a few adjustments, the 400-pound counterweight catapult launched a 12-pound watermelon 113 feet. It was a great success. Mr. Cash even provided watermelon for all the students at the conclusion of all the experiments.

The catapult project turned into more than just a collaborative effort between two teachers. News regarding the innovative project spread throughout the district. It just so happened that the 7th grade teachers at East Middle School heard about the project during the time they were studying the middle ages. It only seemed fit to invite them to bring their seventh graders to the ATC to see a real catapult in operation. There were over two hundred kids in attendance for the special event and they were delighted.

Cash and his students specifically designed both catapults to be easily assembled and disassembled. Both teachers felt the project was so successful that they have agreed to continue this association indefinitely. Each year will bring new experiences and new students – and each year the catapult can be reused - a win-win for all involved.



7th graders enjoy a
“live” catapult
demonstration.

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